

## THE APPLICATION OF THE POPULATION HEALTH INTEGRATED ASSESSMENT MODEL AS AN INSTRUMENT FOR IMPROVING EFFICIENCY OF FUNCTIONING OF HEALTHCARE SYSTEM

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### INTRODUCTION

During the last decade a particular attention is paid to the issues of quality of life of the population due to the current state policy implementation and the country strategic development planning. This situation focuses on the issues of the increasing of the effectiveness of state management in all spheres of economics, immediately connected with providing social services [1]. For the effectiveness assessment of any purposeful action in general terms the correlation of the obtained result and incurred costs is applied [2]. In the sector of healthcare in order to assess costs the quantity of immediate expenditure connected with the providing medical care services is applied. Besides, to assess the health of the population as the basic result of the Russian Federation healthcare system activity the morbidity, mortality and disability rates are used. However, such characteristics do not allow to conduct the integrated quantity assessment of health losses and to assess reliably the effectiveness of the policy implemented in the sphere of healthcare. It requires development and application of new methods of assessment of the healthcare system and its management.

### METHODOLOGY OF THE CALCULATION OF THE QUANTITY RATE OF HEALTHY YEARS OF LIFE LOST

The management of any socio-economic system, especially with high level of hierarchy and dependency on external circumstances referring to the system requires the usage of the activity assessment system which is characterized on the one hand by the high degree of detailed elaboration, on the other hand by the high aggregative potential for defining the tendencies of development as a whole. The usage of DALY along with traditional rates applied in the Russian Federation fully meets such requirements.

The DALY rate is formed by two components, they are YLL (years life lost - years of lost life in the result of premature mortality) and YLD (years lost due to disability - life years lost in the result of health problems (with no account taken of lethal outcomes)).

Russian official statistic instruments do not allow to conduct DALY calculations according to the methodology which is applied abroad. Every fatal case in Russia is recorded to the base of Territorial organ of Federal state statistics service and contains the information about the gender, date of birth, date of death, cause of death and place of residence of the

deceased person. This data allows to perform YLL calculation with the maximal accuracy in every region of the Russian Federation.

For the YLD calculation it is possible to use the data of territorial Medical insurance funds in the form of registries, submitted by medical organizations, which include the description of every case of requesting medical assistance regardless of the type of provided services. Such data organization allows to calculate YLD with proper accuracy.

So, nowadays in the Russian Federation there are all the necessary conditions for the DALY calculation in the country as a whole and in every region.

To conduct the necessary calculations the methods of calculation of the quantity rate of healthy years of life lost were adapted according to the existing system of the statistic registration of medico-demographic information in the territory of Russian Federation. The adaptation allows to calculate the quantity rate of healthy years of life lost for any region and municipal unit of the Russian Federation.

For the solution of the above-mentioned problem in terms of the research they worked out the model of the integrated assessment of the population health for healthcare system management in order to increase the effectiveness of its functioning; modified methods of the integrated assessment of the population health; a range of programmes of analysis and monitoring of health forming factors conducting the proposed methods, the methods of defining potential variants of actions aimed to the decreasing of the population health losses and degree of its preference, the algorithm of defining health forming factors.

The proposed approach allows to increase the effectiveness of the healthcare system management and arrange in the order of health utility decreasing the potential variants for the improvement of population health condition.

### THE POPULATION HEALTH INTEGRATED ASSESSMENT MODEL

In general the population health integrated assessment model can be expressed in the following form:

$$D = \langle Mort, Morb, K, E, F(Yll(b, endo), Yld(b, fact), DalyYll(Yll, Pop), DalyYld(Yld, Pop), Daly(DalyYll, DalyYld), K), Ec, Yll(b, endo), Yld(b, fact), DalyYll(Yll, Pop), DalyYld(Yld, Pop), Daly(DalyYll, DalyYld) \rangle,$$

$Mort = \{Mort_{ij}\}$  – the multitude of characteristics of persons, set in the form of matrix,  $i = 1..m, j = 1..n$ .

$Morb = \{Morb_{ij}\}$  – the multitude of characteristics of persons who applied at the medical organisations, set in the form of matrix,  $i = 1..m, j = 1..n$ .

$n$  – the number of cases applying to the medical organisations and / or death.

$m$  – the number of characteristics of health condition assessment of the one who applied to the medical organisations and/or the deceased one.

$K = \{K_g\}$  – the multitude of factors influencing health condition,  $g = 1..s$ .

$s$  – the number of factors influencing health condition.

$E = \{E_k\}$  – the multitude of factors influencing the choice of potential variants of actions aimed to decrease population health losses and degree of their preference, included in the algorithms of taking administrative decisions,  $k = 1..d$ .

$d$  – the number of factors influencing the choice of potential variants of actions aimed to decrease population health losses and degree of their preference, included in the algorithms of taking administrative decisions.

$F(Yll(b, endo), Yld(b, fact), DalyYll(Yll, Pop), DalyYld(Yld, Pop), Daly(DalyYll, DalyYld), K)$  – the function of defining the influence of population healthforming factors on the population health condition.

$Ec$  – expert system of defining potential variants of actions, aimed to decrease population health losses and degree of their preference.

$Yll(b, endo)$  – the function of defining the quantity rate of healthy years of life lost as a result of premature mortality.

$endo = \{endo_q\}$  – the multitude of aging factors,  $q = 1..r$ .

$r$  – the number of aging factors.

$Yld(b, fact)$  – the function of defining the quantity rate of healthy years of life lost due to health problems.

$fact = \{fact_v\}$  – the multitude of the disease severity coefficients,  $v = 1..w$ .

$w$  – the number of the disease severity coefficients.

$b = \{b_t\}$  – the multitude of cases of disease and/or death referring to nosologic and sex and age groups,  $t = 1..z$ .

$z$  – the number of cases of disease and/or death referring to nosologic and sex and age groups.

$DalyYll(Yll, Pop)$  – the function of defining the quantity rate of healthy years of life lost at a rate of premature mortality per proper population.

$DalyYld(Yld, Pop)$  – the function of defining the quantity rate of healthy years of life lost at a rate of health problems per proper population.

$Pop$  – the certain population in some region of the Russian Federation or a municipal unit and age group.

$Daly(DalyYll, DalyYld)$  – the function of defining the quantity rate of healthy years of life lost.

## ONCLUSIONS

So, the carried out research allows to make a conclusion on the preference of the application of quantity rate of healthy years of life lost as one of the basic indicators of population health condition and effectiveness of healthcare system functioning. The model and the range of programmes worked out during the research can be applied for the solution of a lot of administrative tasks at the regional and municipal levels, beginning from the working-out of basic directions of the development of the sphere as a whole and finishing by forming certain measures to improve population health condition.

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## REFERENCES

- [1] Economic methods of management in health care/under the general edi-torship of V. Uiba. – Novosibirsk: LLC "Alfa-Resource", – 2012. – P. 314.
- [2] Lipsits I. V.. The Economy. Textbook for high schools. – M.: Omega-L, – 2006. – 656 стр.